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Transfer of students' learning about x-rays and computer-assisted tomography from physics to medical imaging

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In this study we explored students' transfer of learning in the X-ray medical imaging context, including the X-ray-based computer-assisted tomography (or CAT). For this purpose we have conducted a series of clinical and teaching interviews. The investigation was a part of a bigger research effort to design teaching-learning materials for pre-medical students who are completing their algebra-based physics course. Our students brought to the discussion pieces of knowledge transferred from very different sources such as their own X-ray experiences, previous learning and the mass media. This transfer seems to result in more or less firm mental models, although often not internally consistent or coherent.

Based on our research on pre-med students' models of X-rays we designed a hands-on lab using semi-transparent Lego bricks to model CAT scans. Without "surgery" (i.e. without intrusion into the Lego "body") students determined the shape of an object, which was built out of opaque and translucent Lego bricks and hidden from view. A source of light and a detector were provided upon request. Using a learning cycle format, we introduced CAT scans after students successfully have completed this task. By comparing students' ideas before and after teaching interview with the groups of 2 or 3 participants, we have investigated transfer of learning from basic physics and everyday experience to a complex medical technology and how their peer interactions trigger and facilitate this process.

During the last phase of our research we also introduced a CAT-scan simulation problem into our teaching interview routine and compared students' perception of this simulation and their perception of the hands-on activity.

Keywords: physics education; X-rays; CAT-scans; mental models; transfer of learning; medical physics

Graduation Month: December
Degree: Doctor of Philosophy
Department: Department of Physics
Major Professor: Dean A. Zollman
Date: 2008

Dissertation

Files in this item

Filename: SpartakKalita2008.pdf
Size: 1.296Mb

View/Open

Record URL: http://hdl.handle.net/2097/1052

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The invention of computers has enabled complex machines like Computer Axial Tomography (CAT) scanners to be built. These have an X-ray generator that is mounted in such a way that it can be moved right round the body. It takes X-ray images as it moves and a computer converts the data to three-dimensional images of the inside of the body. Roentgen had used a fluorescent screen in his first experiments which provided 'live' images rather than a photograph. This technique is still used and is now called 'fluoroscopy'. It is often used to examine patients with digestive system ... X-rays are a type of electromagnetic radiation that has a much shorter wavelength than visible light. Today, radiowaves and X-rays produce stunning high resolution images deep in tissue; antimatter (in the form of positron emission tomography or PET) is used daily at Duke Hospital to diagnose cancer; and X-ray, γ ray and charged particle beams are used to kill diseased cells. Close submenu For Prospective Students. Learning About Physics. Learning About Biophysics. Credit for College Board Advanced Placement (AP). Close submenu Physics Majors & Minor. Modalities, Medical imaging. Computed Tomography. Edit. Older and less preferred terms that also refer to x-ray CT are computed axial tomography (CAT scan) and computer-assisted tomography. X-ray CT is a form of radiography, although the word "radiography" used alone usually refers, by wide convention, to non-tomographic radiography. CT produces a volume of data that can be manipulated in order to demonstrate various body parts based on their ability to block the x-ray beam.

"The Essential Physics of Medical Imaging." https://www.inkling.com/read/essential-physics-medical-imaging-jerrold-bushberg-3rd/chapter-10/10-3-modes-of-ct-acquisition. Computed tomography (CT) is well-known imaging tech-nique that allows for non-invasive visualization of the interior of an object. It is widely used in many applications such as medical imaging [22], [23], non-destructive testing [24], industrial metrology [25], food industry [26], [27], and security [28]. If indeed many X-ray projections from all angles are available, FBP generally leads to high quality reconstructions. If these two conditions are not satised (e.g. in case of limited angle scanning or related missing data problems), severe streaking artefacts appear in the re-constructed image. III. In the near future the medical imaging industry in general and CT reconstruction in particular moves to a new level with the approval of Machine Learning techniques and their amazing outcomes. Input. Essential Physics of Medical Imaging. Computed Tomography - History and Technology MIND 4561699 2. MCQ.Companion.to.Applied.Radiological.Anatomy.3HAXAP. Hispeed CT Scan Operator Manual. X PREFACE Introduction 1 Tomography refers to the cross-sectional imaging of an object from either transmission or reflection data collected by illuminating the object from many different directions. The impact of this technique in diagnostic medicine has been revolutionary, since it has enabled doctors to view internal organs with unprecedented precision and safety to the patient. 2 computerized tomographic imaging. aim is the same as with x-rays, viz., to reconstruct the cross-sectional image of, say, the attenuation coefficient.